isolated barometric observation, whether above or below the normal, *has no value whatever* and becomes useful only when taken in reference to others.

As a last and quite secondary remark, may I point out that the example of reduction of wind velocity selected by Professor McAdie could not be more unfortunately chosen. Every one who has to deal with velocities of that order knows that 60 miles per hour is equivalent to 88 feet per second, and it does not require any time or labor to see that 6 miles per hour is 8.8 feet per second. I am no expert and very poor at mental arithmetic, yet I can, in the twinkling of an eye, reduce the decimal to inches and decimals without pencil and paper, since (to illustrate the mental process followed),

$$\frac{8}{10} \text{ feet} = \frac{8\times 12}{10} \text{ inches} = \frac{96}{10} \text{ inches, or 9.6 inches,}$$

so that the speed is 8 feet 9.6 inches per second; but 8.8 feet is much preferable. Of course it is easy to select cases where this reduction is not so readily made. I think the chief objection to stating the velocity of wind in miles per hour, at any rate when the wind pressure is concerned, is that the latter being expressed in pounds per square foot, the same expression contains *two different* units of length, namely, the foot and the mile, being therefore irrational.

ADOPT THE KELVIN THERMOMETER SCALE AND THE METRIC SYSTEM.

By HENRY HELM CLAYTON. Dated Blue Hill, Mass., February 12, 1909.

I have read with interest the suggestions made by Prof. A. G. McAdie in the MONTHLY WEATHER REVIEW for November, 1908, p. 372. I wish very much that our Weather Bureau could see a way to adopt the metric system; but I believe it would be a misfortune if it should also adopt with it the centigrade thermometer scale. This scale is poorly adapted to meteorological work. In our climate [New England] nearly half the readings would be above and half below 0° C. This would be a constant source of confusion and mistakes. Each time the temperature fell below zero the observer would need to invert his method of reading. The normal method of estimating subdivisions in a vertical scale is to read the whole number on the scale and estimate the tenths upward. Thus if the thermometer reads 1.2° below zero the tendency is to read the 2° on the scale [next below the top of the mercury column] and estimate the tenths upward [to the top of the mercury column], thus making the reading —2.8° instead of —1.2° as it should be in reading downward. My experience convinces me that mistakes of this kind are not uncommon. Again it is confusing and a source of error to have two sets of values only distinguishable from each other by the presence or absence of a minus sign.

It is not uncommon to see in newspapers where matter must be printed hurriedly, and even sometimes in books, a temperature given without the minus sign. Thus a temperature of fifteen degrees below zero may be printed as 15° without the minus sign, hence, giving an entirely erroneous idea of its value. With the adoption of the centigrade scale the Bureau would need to be constantly on its guard against such errors. Again with half the values in a column of figures plus and half minus the addition for the purpose of obtaining means is very troublesome and would undoubtedly increase the time and cost of the work.

Hence I am led to renew a suggestion which I made ten years ago in Nature[1] namely that when the metric system comes into use by the English-speaking peoples, as it must in time, the Kelvin thermometer scale be adopted with it instead of the centigrade scale.

In the Kelvin scale the freezing point of water is 273° and the boiling point is 373°. It is a scale based on well-ascertained physical phenomena such as the rate of expansion of gases, the conductivity of metals, etc. It is a scale which enters into many of the mathematical formulas used in meteorology and it is a scale which is coming more and more into use for recording very low temperatures such as the freezing points of air and of hydrogen. So that if the centigrade scale were adopted there would still be two scales in use.

The only serious objection that I can see to the adoption of the Kelvin thermometric scale, is the increased number of figures required in recording and printing meteorological observations. But this is not so great as it appears. Printed columns of figures in degrees centigrade must, as a rule, reserve room for the printing of three figures to the left of the decimal point. It takes as much time and room to write —15° C. as it does to write the equivalent 258° K.

The adoption of the Kelvin scale with the metric system has already been recommended by a committee of the British Association (June, 1904) and if it should be adopted by the U. S. Weather Bureau either alone or in agreement with the English Meteorological Office, it would undoubtedly come into general use and become a universal scale, forever free from the troublesome below zero values.

[1] Nature, September 21, 1899, 60:491.

EXPRESS ALL BAROMETRIC MEASUREMENTS BY ORDINARY GENERAL UNITS OF FORCE.[1]

By Prof. Dr. W. KOEPPEN, Hamburg. Dated February 7, 1909.

[Translated by C. ABBE, jr., April, 1909.]

In the MONTHLY WEATHER REVIEW for November, 1908, Prof. A. G. McAdie, the well-known official in charge of the California Section of the U. S. Weather Service, makes a very noteworthy proposal. He recommends that the Weather Bureau should, as soon as possible, adopt the centigrade (not Celsius) scale and the metric system in measuring temperature, wind, rain, and snow; but he goes further and suggests that the Bureau should cut loose from the accident of the employment of mercury in the barometer and adopt as unity the mean standard pressure of 760 mm.=29.92 inches, calling it 1,000 for convenience sake.

The unification of the measures and scales of the meteorological world, through the adoption of the metric and centigrade systems by England and America, as suggested by Professor McAdie, is an advance most heartily to be desired. So extensive an observing system can not, however, be expected to change its present scales until persuaded of the perfect fitness and adaptation of that which is to be substituted. And it is not to be denied that our mode of expressing air pressure is still deficient in these lines.

Professor McAdie's proposal to adopt the pressure of 760 millimeters (which is already used in this sense as "one atmosphere") as the unit in all pressure measurements, would indeed bring about an undeniable advance were it not that this particular "normal pressure" or "Normaldruck" is a wholly conventional value. As is well known, the average barometric pressure even at sea level is very different for different places. Even this adopted value of 760 millimeters is only related to the metric system through a new quantity, the density of mercury. If this latter be eliminated, then the value 760 millimeters signifies a pressure of 1033.291 grams on 1 square centimeter if the gram is regarded as a unit of force. Physicists, however, recognize that it is more rational to conceive of the gram as a unit of mass, rather than a unit of force, and to take as unit of force the product gram × acceleration of gravity, i. e., value of 980.65 centimeters which is for latitude 45° at sea level. Thus a barometric reading of 760 millimeters, under normal gravity, corresponds in the C. G. S. system to 1,013,303 units. One

[1] Published simultaneously in Met. Zeitschr., May, 1909, 26:198–201.